

Asteroid Geophysics and Quantifying the Impact Hazard

D. Sears (BAERI), D. H. Wooden (NASA Ames), D. G. Korycansky (UCSC)

Probably the major challenge in understanding, quantifying, and mitigating the effects of an impact on Earth is understanding the nature of the impactor. Of the roughly 25 meteorite craters on the Earth that have associated meteorites, all but one was produced by an iron meteorite and only one was produced by a stony meteorite. Equally important, even meteorites of a given chemical class produce a wide variety of behavior in the atmosphere. This is because they show considerable diversity in their mechanical properties which have a profound influence on the behavior of meteorites during atmospheric passage. Some stony meteorites are weak and do not reach the surface or reach the surface as thousands of relatively harmless pieces. Some stony meteorites roll into a maximum drag configuration and are strong enough to remain intact so a large single object reaches the surface. Others have high concentrations of water that may facilitate disruption. However, while meteorite falls and meteorites provide invaluable information on the physical nature of the objects entering the atmosphere, there are many unknowns concerning size and scale that can only be determined by from the pre-atmospheric properties of the asteroids. Their internal structure, their thermal properties, their internal strength and composition, will all play a role in determining the behavior of the object as it passes through the atmosphere, whether it produces an airblast and at what height, and the nature of the impact and amount and distribution of ejecta.